

PCT/NZ2004/000292

REC'D 28 DEC 2004

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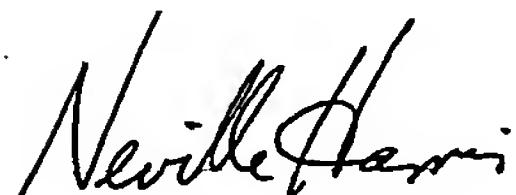
## CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 18 November 2003 with an application for Letters Patent number 529621 made by GREIG REID BREBNER.

Dated 13 December 2004.

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**PATENTS ACT 1953**  
**PROVISIONAL SPECIFICATION**

**UMBRELLA**

I, Greig Reid Brebner, a New Zealand citizen of 214 Riddell Road,  
Glendowie, Auckland, New Zealand

do hereby declare this invention to be described in the following statement:

## UMBRELLA

### TECHNICAL FIELD

This invention relates to umbrellas and in particular though not solely to canopy extension and tensioning mechanisms for umbrellas.

### 5 BACKGROUND ART

Umbrellas may be used to protect a user from the sun, wind or rain and may be portable or designed to be fixed to the ground (such as sun umbrellas having generally larger dimensions than portable rain umbrellas).

Fundamentally, the basic design of umbrellas has not changed in the past three 10 centuries. Conventional umbrellas include a shaft to which a canopy is attached at one end and a handle is attached at the other end. A collapsible frame is included so that when not in use the umbrella may be lowered into a more compact state which may more easily be stored.

The collapsible frame consists of a number of ribs (usually eight ribs) evenly 15 distributed about the shaft and pivotally connected at their inner ends to the canopy end of the shaft. The perimeter of the canopy is attached (often simply tied by threads) to the outer ends of each of the ribs which are usually terminated in a point or protrusion. In order to assist in spreading the ribs apart and holding them in position, each rib is provided with a brace or strut which is pivotally connected at one 20 of its ends along the rib's length and at its other end it is pivotally connected to a slider which is slidable along the shaft. The slider is lockable in position near the canopy end of the shaft when in use.

Minor improvements have been made to the above described basic design for improved user convenience. Improvements include push-button self-erecting

mechanisms usually incorporating a spring in which energy stored during collapsing of the umbrella is utilised to move the slider up the shaft to thereby erect the umbrella. Another relatively recent improvement is the provision of umbrellas which "fold down" to fit within a hand bag or briefcase for example. Umbrellas of this variety usually

5 include a multi-segment shaft in which successive segments are a slide fit within preceding segments. Further reductions in size are achieved by the use of multi-segmented canopy supporting ribs which are pivotally connected together and are collapsible in upside-down 'V' or 'W' shaped formations.

Problems with the above described conventional design (and its minor improvements)

10 include the provision of the point or protrusion which when in use, is positioned at or about eye level of passers-by and therefore poses a safety hazard. Also, in strong wind conditions the canopy is liable to become detached from the frame while the frame has a tendency to turn inside-out, often resulting in irreparable damage to the umbrella frame and/or canopy.

15 It is also noted that in most if not all conventional umbrella designs, the canopy material is not optimally tensioned. This is because during erection of umbrellas having conventional frame designs, the vertical force provided by the user on the slider is converted to compressive forces acting on the struts which in turn inefficiently convert the force into canopy tension. As the umbrella approaches its completely

20 erect state, the struts approach the horizontal such that the majority of the effort being exerted by the user (the horizontal component of the strut force) is not being used while only a small proportion of the user's effort (the vertical component of the strut force) is usefully being employed in tensioning the canopy. This is readily observed when erecting conventional umbrellas in which resistance to slider movement

25 becomes increasingly apparent at the end of the slider's travel. Accordingly, in conventional umbrella designs, tension which could usefully be employed in the canopy is wasted in the ribs.

It would also be an advantage if a canopy extension and tensioning mechanism could be developed in which the canopy could easily be replaced should it be desired or necessary.

It is therefore an object of the present invention to provide an umbrella which will go at 5 least some way towards overcoming the above disadvantages or addressing the above problems or which will at least provide the public with a useful choice.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors 10 assert, and the applicants reserve the right to challenge the accuracy and pertinence of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

15 It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or 20 elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

#### DISCLOSURE OF INVENTION

Accordingly, in one aspect the invention may broadly be said to consist in an umbrella having a canopy attached to a frame, the frame comprising:

25 a shaft having a canopy end at or adjacent which the canopy is attached to the frame, and

canopy extending and tensioning means including a plurality of rib means spaced about and pivotally extending radially from, or adjacent to, the canopy end of the shaft,

wherein a part of said rib means is slidable radially with respect to said shaft.

- 5 Preferably, canopy tensioning means are provided at the end of each rib means furthest from the shaft.

Preferably, a plurality of pockets are provided in the perimeter of the canopy, each one of which receives a canopy tensioning means.

- 10 Preferably, each rib means includes an inner rod extending between the shaft and a canopy tensioning means and an outer tube slidable on said inner rod.

Preferably, each canopy tensioning means includes a load spreading surface adapted to transfer radial force from the outer tube of said rib means to the periphery of said canopy, wherein said load spreading surface effectively extends during erection of said umbrella.

- 15 Preferably, said canopy tensioning means comprises two pivotally connected legs connected together at a pivot region and forming a substantially 'V' shape when said umbrella is in an unerected state and wherein said legs are spread apart during erection to form a substantially 'T' shape when the umbrella is in an erected state, the two legs and the pivot region transferring radial forces to the canopy during erection.

- 20 Preferably, the outer end of an inner rod is attached to the pivot region of a canopy tensioning means and the outer end of an outer tube is connected to each of the legs of said canopy tensioning means.

Preferably, the outer end of an inner rod is received within a longitudinal bore provided in a stopper connected to or forming a part of the pivot region of a canopy tensioning means.

Preferably, the outer end of the inner rod is slidable within the longitudinal bore.

Preferably, each canopy tensioning means includes first and second spreading members, each pivotally connected between a respective pivotally connected leg and a tube mounting hub connected to said outer end of said outer tube, said inner rod 5 passing through the tube mounting hub.

Preferably, said canopy tensioning means is integrally formed from a plastics material wherein living hinges form the pivotal connections.

Preferably, said canopy extending and tensioning means also includes a primary sliding means slidable along the shaft and a plurality of primary support struts each 10 pivotally connected to said primary sliding means and each also pivotally connected to the inner end of a respective outer tube.

Preferably, said canopy extending and tensioning means also includes a secondary sliding means slidable along the shaft between said primary sliding means and the canopy end of said shaft, and a plurality of secondary support struts each pivotally 15 connected to said secondary sliding means and also each pivotally connected to a respective primary support strut.

Preferably, said secondary support struts are shorter than said primary support struts.

Preferably, each secondary support strut is connected to a primary support strut a pre-determined distance from its connection with said primary sliding means, wherein 20 said pre-determined distance is substantially equal to the length of said secondary support strut.

Preferably, each secondary support strut is connected to a primary support strut about half way along the primary support strut.

Preferably, no more than six rib means are provided about said shaft.

## **BRIEF DESCRIPTION OF DRAWINGS**

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

5 Figure 1 is a perspective view from beneath of an umbrella according to a preferred embodiment of the present invention;

Figure 2 is an enlarged perspective view of the main components of the canopy extending and tensioning means or mechanism of the umbrella of Figure 1,

10 Figures 3A to 3F are a series of perspective views from the front and slightly above of the umbrella of Figure 1 without its canopy, showing the actions of the components of the canopy extending and tensioning mechanism at various stages during erection of the umbrella,

15 Figures 4A to 4F are a series of side elevational views corresponding to Figures 3A to 3F showing the action of a single rib and its associated struts and sliders at various stages during erection of the umbrella of Figure 1, and

Figures 5A to 5E are a series of perspective views of the canopy tensioning means of the ~~umbrella~~ of Figure 1 at various stages during erection of the umbrella of Figure 1.

20

## **BEST MODES FOR CARRYING OUT THE INVENTION**

With reference to the drawings and in particular Figures 1 and 2 initially, an umbrella 1 according to the present invention is shown. Umbrella 1 includes a frame having a

shaft 2 with a canopy 3 at one end and a handle 4 at the opposite end of the shaft. Shaft 2 may be solid or hollow and may be cylindrical or have an alternative cross-sectional shape such as square, hexagonal or octagonal. The frame includes a canopy extending and tensioning means at the canopy end of shaft 2, the structure of 5 which is described below.

As most clearly shown in Figure 2, at or near the canopy end of shaft 2 a rose or circular flange or washer 5 is provided. Washer 5 is axially fixed and non-slidable on shaft 2. A plurality of ribs 6 are pivotally connected to and equally radially spaced about washer 5. Due to the added structural strength provided by the construction of 10 the present invention, no more than six ribs 6,7 need be provided about washer 5 although more than six ribs may be provided.

Each rib comprises an inner rod 6 extending between washer 5 attached to the shaft and a canopy tensioning means 8 (explained below with reference to Figures 5A to 5E) which is hidden within pocket means 9 spread about the periphery of the 15 underside of canopy 3. An outer tube 7 is provided about and slidable along an inner rod 6 at or near its end furthest from shaft 2. The inner rods 6 and outer tubes 7 should have a complimentary cross-sectional shape to allow the outer tube 7 to slide along the inner rod 6. Preferably the inner rod 6 and outer tube 7 are circular in cross-section but other shapes such as square, hexagonal or octagonal could be used. The 20 inner end of each outer tube 7 is provided with a coupling 10, which may be formed from polycarbonate, pivotally receives the outer end of a primary strut 11.

The inner end of each primary strut 11 is pivotally connected to an annular protrusion about a primary sliding means or primary slider 12 which is slidable along shaft 2. Movement of primary slider 12 (either manually or spring assisted) up and down shaft 25 2 causes the umbrella to be erected or collapsed respectively. Conventional locking means such as a spring-loaded shaft protrusion may be provided on the shaft to enable sliding means 12 to be retained in position such that the umbrella may be

locked in either its erected or collapsed state.

A secondary strut 13 is connected between a mid-point of each primary strut 11 and a secondary sliding means 14 which is slidable on shaft 2 between washer 5 and primary sliding means 12. The connection between secondary strut 13 and primary

5 strut 11 allows relative pivotal movement therebetween. In the embodiment shown, a connection ring 15 which may be formed from polycarbonate is fixed to the primary strut 11 about half way along its length and the outer end of secondary strut 13 is forked with both prongs connected to connection ring 15 by pins. The connection between secondary strut 13 and secondary sliding means 14 allows pivotal relative  
10 movement therebetween.

The upper side of each secondary strut 13 may be "U" shaped or generally convex to allow its associated primary strut to be accommodated therein when the umbrella is in its collapsed state in order to minimise the volume of the collapsed frame. In order to compensate for this reduction in size, it can be seen that the secondary struts 13 may

15 be flattened and wider than primary struts 11 and ribs 6.

Shaft 2, washer 5, primary 12 and secondary 14 sliders, primary 11 and secondary 13 struts, ribs 6,7 and each of the fittings and connectors may all be manufactured from metal such as aluminium or galvanised steel or stainless steel or a substantially rigid plastics material such as high density polyethylene or extruded polypropylene.

20 Preferably, inner rods 6 (and to a lesser extent outer tubes 7) are manufactured from a flexible or elastically bendable material to allow the canopy to assume a curved shape once erected.

In a preferred embodiment, washer 5, primary 12 and secondary 14 sliders are formed from polypropylene, primary struts 11 and inner rods 6 are formed from  
25 pultruded fibreglass rod, outer tube 7 is formed from extruded polypropylene tube and secondary struts 13 are formed from polycarbonate.

Canopy 3 may be formed from any conventional wind/rain/sun-proof fabric such as canvas or nylon. The dimensions of the canopy are arranged so that the distance from the centre of the canopy to the furthest point within each pocket 9 is substantially equal to the distance from the shaft to the outermost point of a canopy tensioning 5 means 8.

The operation of the canopy extending and tensioning means of the umbrella will now be described with reference to Figures 3A to 3F, 4A to 4F and 5A to 5E.

With reference firstly to Figures 5A to 5E it can be seen that each canopy tensioning means 8 includes first 16 and second 17 legs pivotally connected at a pivot region 22.

10 In the umbrella's collapsed state as shown in Figure 5A, legs 16 and 17 are positioned in a substantially "V" shaped formation. The outer end of outer tube 7 is held captive within a tube mounting hub 18 having forked legs 19 and 20 pivotally attaching the tube mounting hub 18 to respective legs 16 and 17. Tube mounting hub 18 includes a central passage through which the outer end of an inner rod 6 is passed 15 before terminating in stopper 21, the end of which is coterminous with the pivot region 22 between legs 16 and 17. Stopper 21 is formed as an elongate member having a central longitudinal bore commensurate in diameter with the end of inner rod 6. the end of inner rod 6 is slidable within stopper 21.

Canopy tensioning means 8 may be integrally formed from a plastics material such as 20 polypropylene random copolymer with each of the pivotal connections formed as living hinges.

As the outer end of outer tube 7 slides along inner rod 6 towards the outer end of the rib, it can be seen in Figures 5A to 5E that legs 16 and 17 are splayed or spread until in Figure 5E the legs are in a substantially "T" shaped formation when outer tube 7 25 reaches the end of its travel and tube mounting hub 18 contacts stopper 21.

Additional radial outwards movement of outer tube 7 will move the entire canopy

tensioning means outward with respect to inner rod 6. In practice, legs 16 and 17 will bend in an arc or substantially "U" shape when acting to tension the canopy from within pockets 9 as the pockets are convex to allow tensioning force from canopy tensioning means 8 to be smoothly applied to the canopy periphery.

5 In Figures 3A and 4A the umbrella is shown in its fully collapsed state with ribs 6,7 lying substantially against or adjacent to shaft 2 and legs 16 and 17 of canopy tensioning means 8 in a closed substantially "V" shaped formation.

In Figures 3B and 4B the primary sliding means 12 has been moved upwards along shaft 2 to around the mid-point of shaft 2. It can be seen that the ribs are being

10 pivoting away from shaft 2 by primary struts 11. Secondary sliding means 14 is still some distance away from but being pushed towards end washer 5 by secondary struts 13. Legs 16 and 17 of canopy tensioning means 8 have opened slightly when compared to their closed state shown in Figures 3A and 4A.

In Figures 3C and 4C secondary sliding means 14 has reached end washer 5 and

15 has therefore reached the end of its movement. Primary sliding means 12 is still being moved upwards towards its upper stop and therefore the ribs 6,7 are still rotating out from shaft 2. The inner ends of secondary struts 13 are now fixed in position such that the secondary struts are now limited to pivotal movement about their inner ends. The outer ends of secondary struts 13 now act as fulcrums to a mid-point of primary struts 20 11 such that any further upward movement of primary slider 12 causes primary struts 11 to act as levers about these fulcrum points thereby generating a mechanical advantage to produce a resultant radial force at the outer ends of the primary struts 11 acting along the ribs 6. This resultant force acts upon the inner ends of the outer tubes 7. It can also be seen that legs 16 and 17 of canopy tensioning means 8 have 25 opened further than in Figures 3B and 4B.

In Figures 3D and 4D it can be seen that the primary sliding means 12 has been

5 moved further up towards end washer 5, that ribs 6 have pivoted out further from shaft 2 and that outer tubes 7 have been displaced or slid along their respective inner rod 6, away from shaft 2. It can also be seen that legs 16 and 17 of canopy tensioning means 8 are splayed considerably so that the canopy (not shown) will be tensioned  
5 due to the radial force acting along outer tubes 7 and it will also be noted that this radial force will be transferred to the canopy periphery (via a seam formed in each pocket 9) along a line or load-spreading surface formed by legs 16 and 17 of canopy tensioning means 8 rather than at a point as in conventional umbrellas.

10 In Figures 3E and 4E it can be seen that primary slider 12 is approaching the end of its movement and that as the inner ends of the primary struts 11 have moved upwards, their outer ends have been forced further along the inner rods 6. As the outer ends of primary struts 11 slide further along inner rods 6 the outer tubes 7 are forced outward further so that legs 16 and 17 of canopy tensioning means 8 are further splayed.

15 In Figures 3F and 4F it can be seen that primary slider 12 has now reached the end of its travel up shaft 2 and that the outer tubes 7 have reached the end of their travel along inner rods 6 so that legs 16 and 17 of canopy tensioning means 8 are fully splayed as shown in Figure 5E. In this position, any additional upwards force on primary slider 12 is converted into tension in the canopy as the entire canopy  
20 tensioning means 8 moves radially outward, effectively increasing the length of the umbrella's ribs. Equally, any external force such as a gust of wind acting beneath the canopy will find it difficult to invert the umbrella because to do so would require primary struts 11 rotating or moving upwards which movement is resisted by secondary struts 13. In this position the periphery of the canopy 3 tightened radially  
25 thereby increasing the strength of the umbrella structure and improving the rain resistance ability of some canopy materials.

As previously mentioned, canopy 3 is primarily attached to the umbrella frame by

virtue of canopy tensioning means 8 being located within purpose-built pockets 9 provided at equally spaced locations around the periphery of the canopy. Additionally, the canopy could be fixed to the end of shaft 2 (to washer 5 for example) and/or connected to ribs 6,7 at some point along their length by for example ties (not shown)

5       sewn into the underside of the canopy which may be tied or connected about each of the ribs. A preferred connection system could incorporate VELCRO® releasable fasteners comprising loops and hooks provided on respective opposing tie surfaces to allow the canopy to be easily removed should it be necessary or convenient to do so.

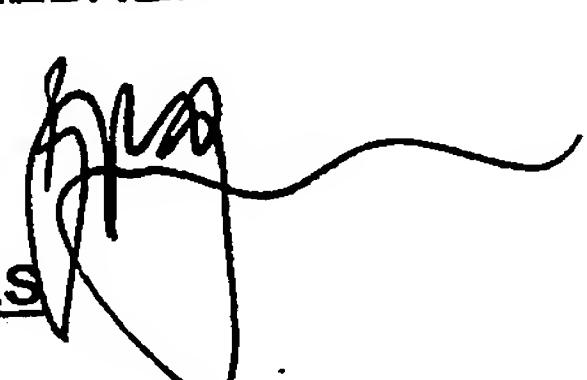
Accordingly, a user could regularly alter or select a particular canopy for use with the

10      umbrella frame according to the present invention which could easily be fitted or removed by the user without tools.

It will be appreciated that the present invention is applicable to rain umbrellas, sun or beach umbrellas and parasols and that the invention is equally applicable to collapsible shaft umbrellas or fixed shaft umbrellas. It should also be noted that

15      aspects of the invention could be incorporated into other umbrella-like devices in which support ribs or arms are generally radially attached to a central post or pole such as in collapsible rotary clothes lines, tents or awnings/sun shades. In the case of collapsible rotary clothes line it would of course not be necessary to incorporate features such as the canopy tensioning means at the end of each rib.

20      Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.

GREIG REID BREBNER  
25      by his Attorneys  
  
JAMES & WELLS

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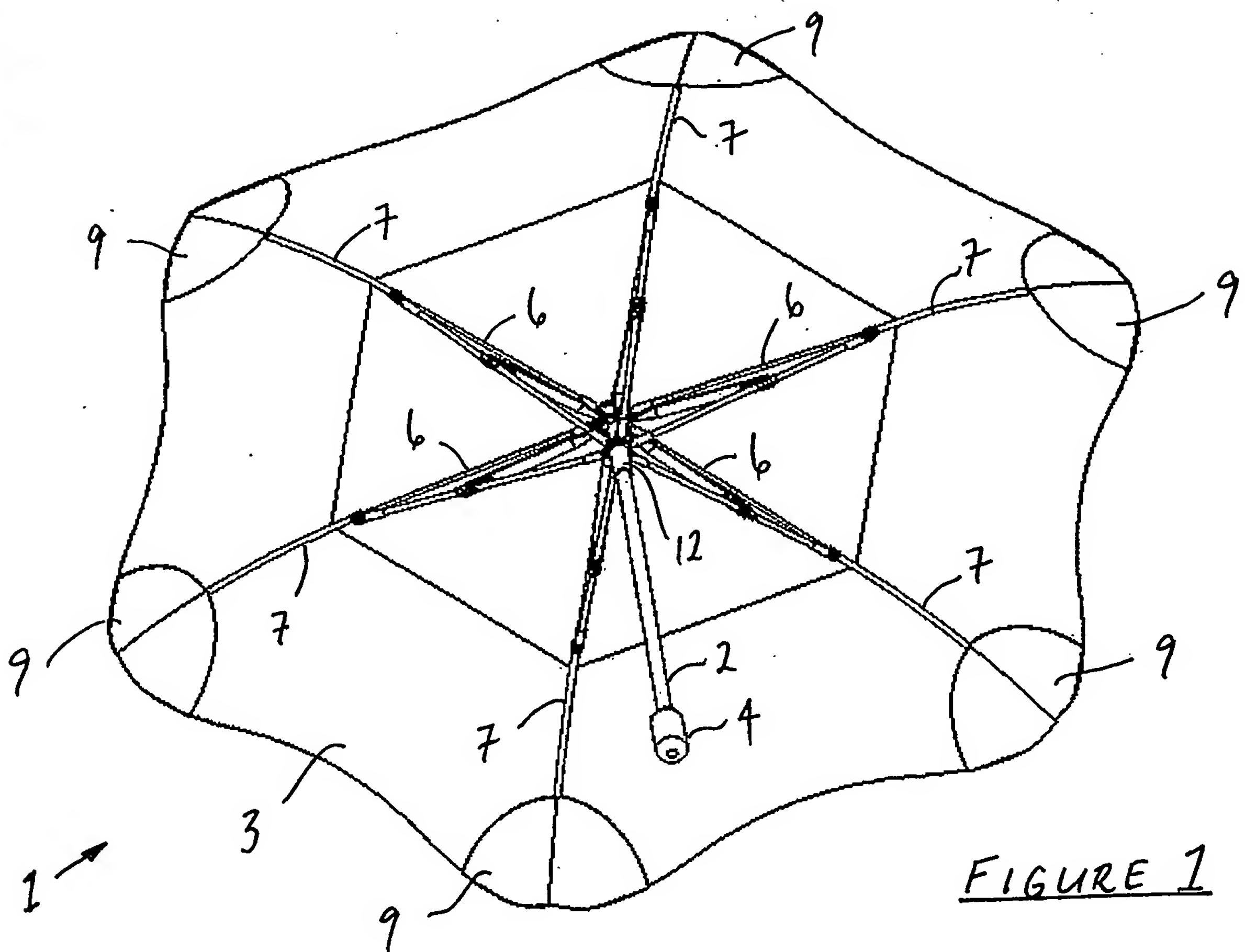


FIGURE 1

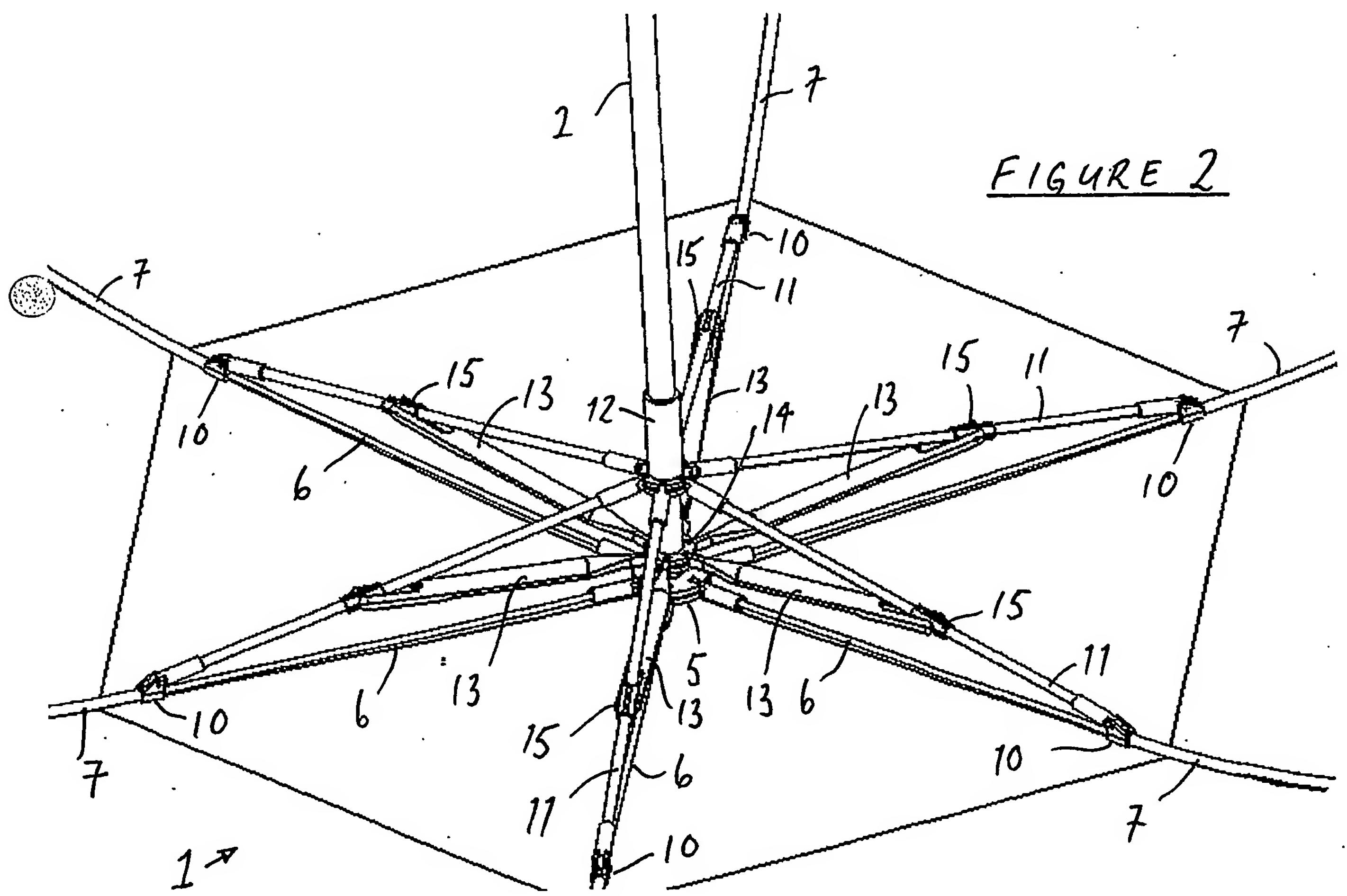


FIGURE 2

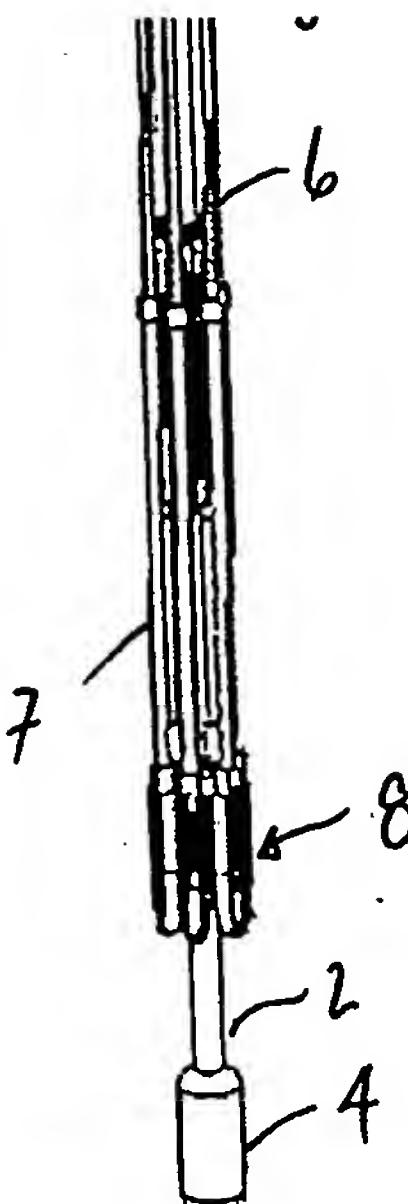


FIGURE 3A

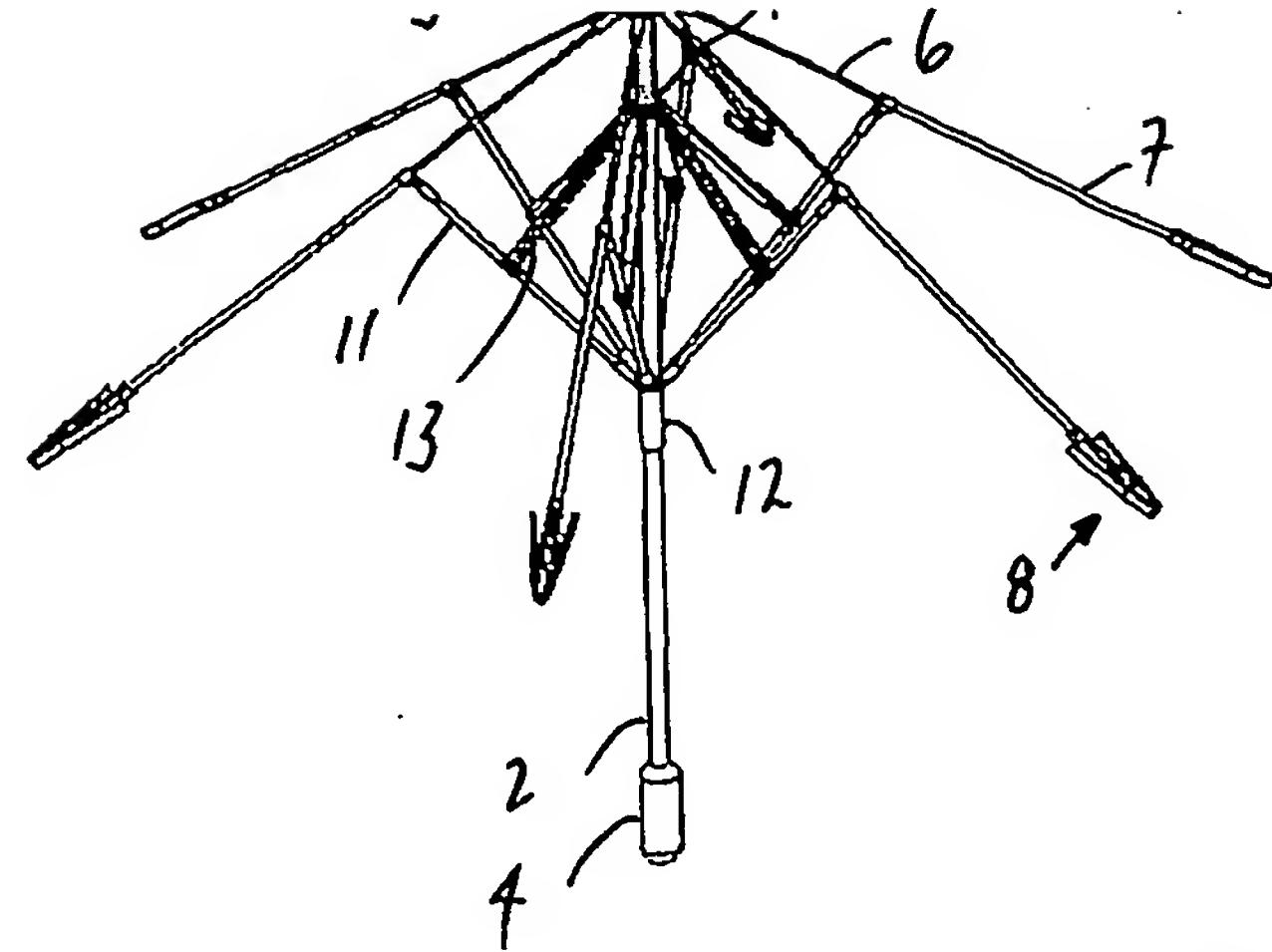


FIGURE 3B

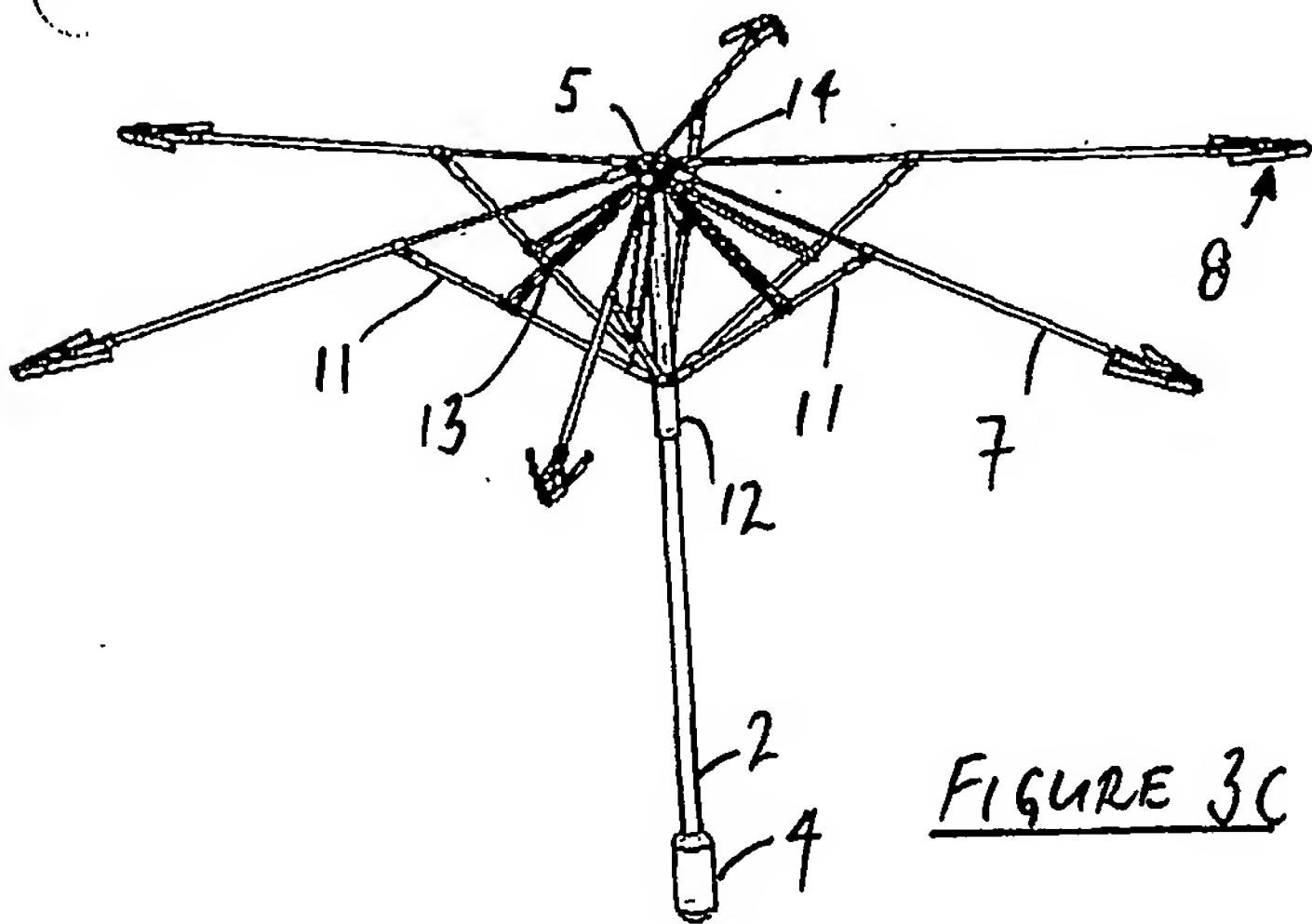


FIGURE 3C

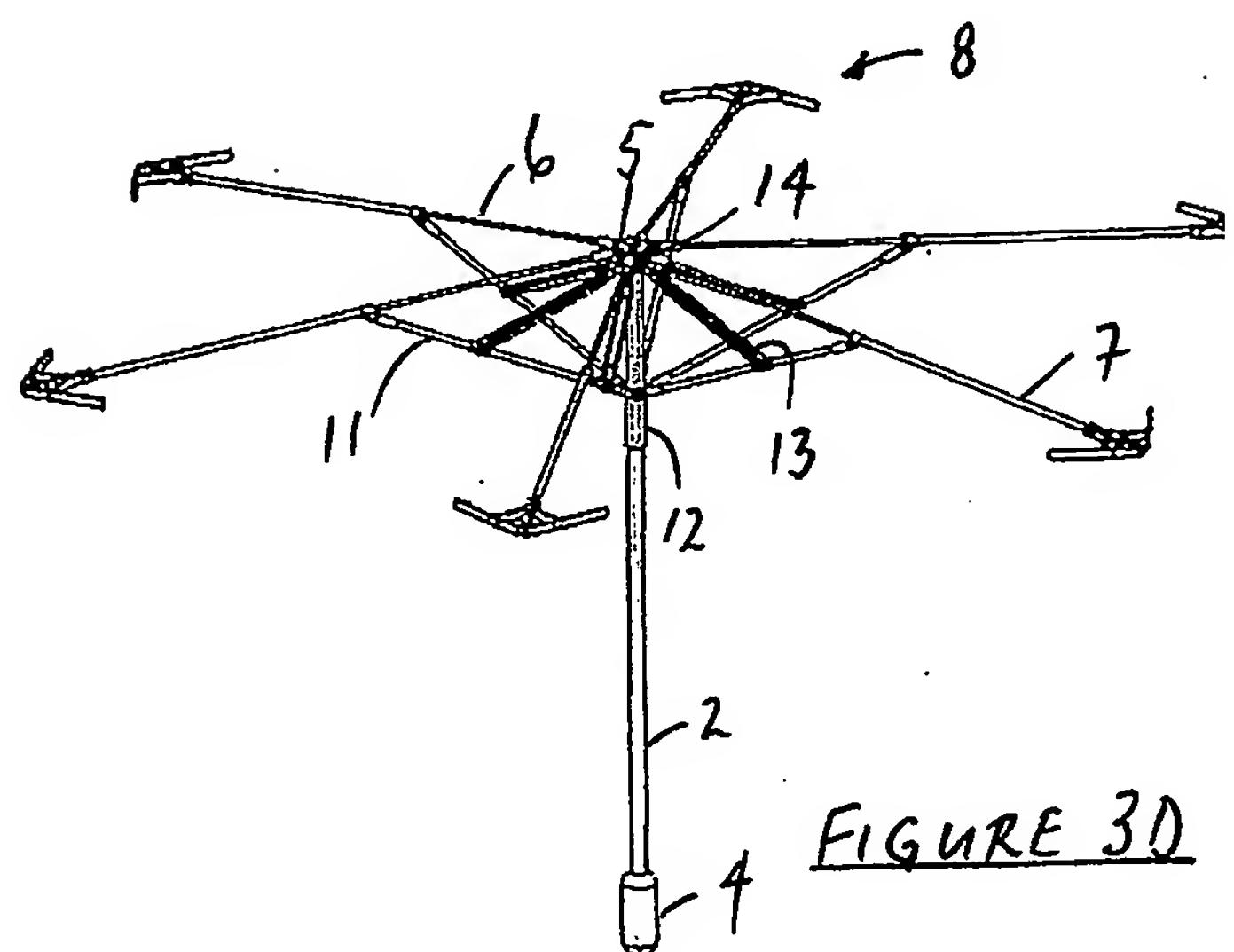


FIGURE 3D

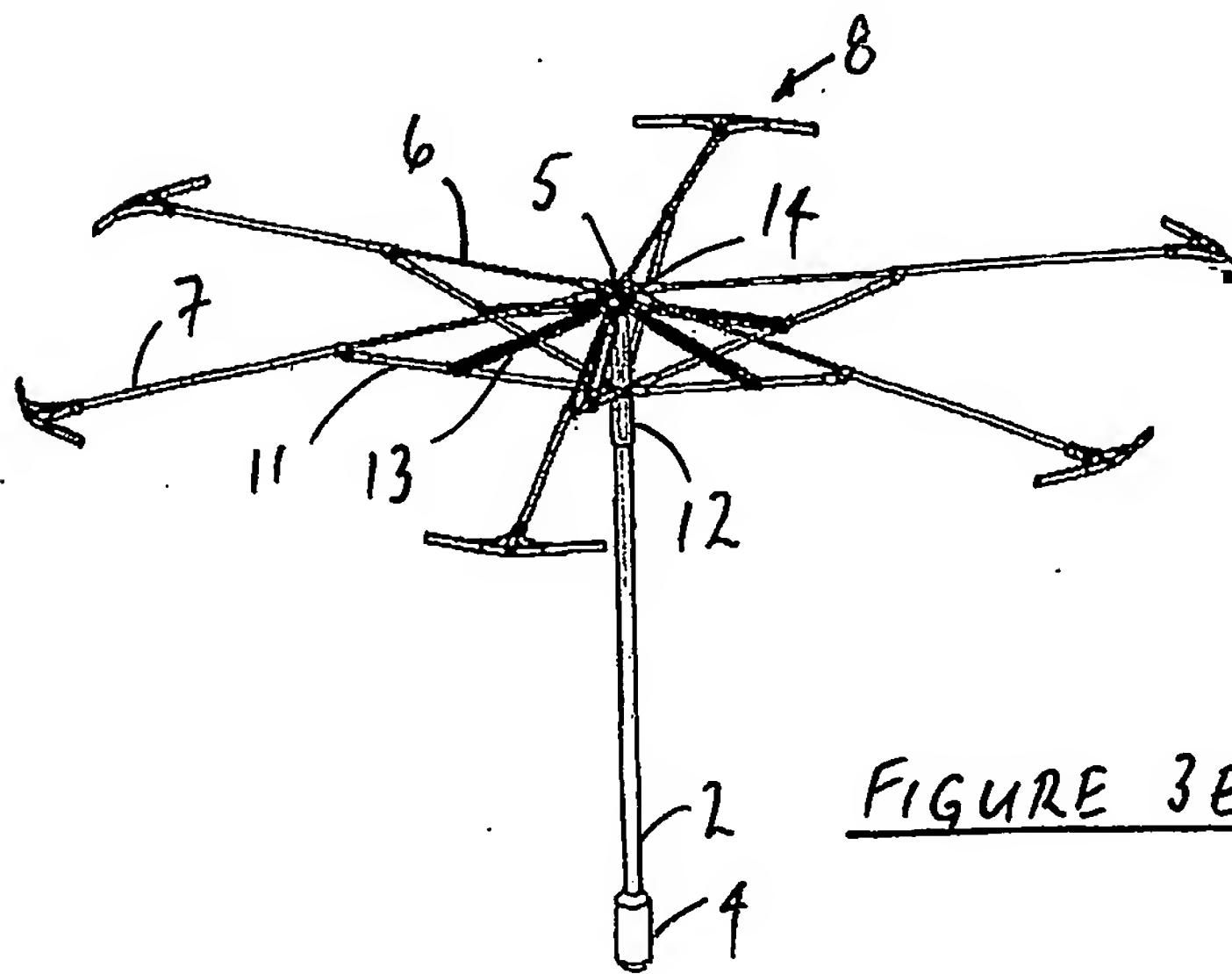


FIGURE 3E

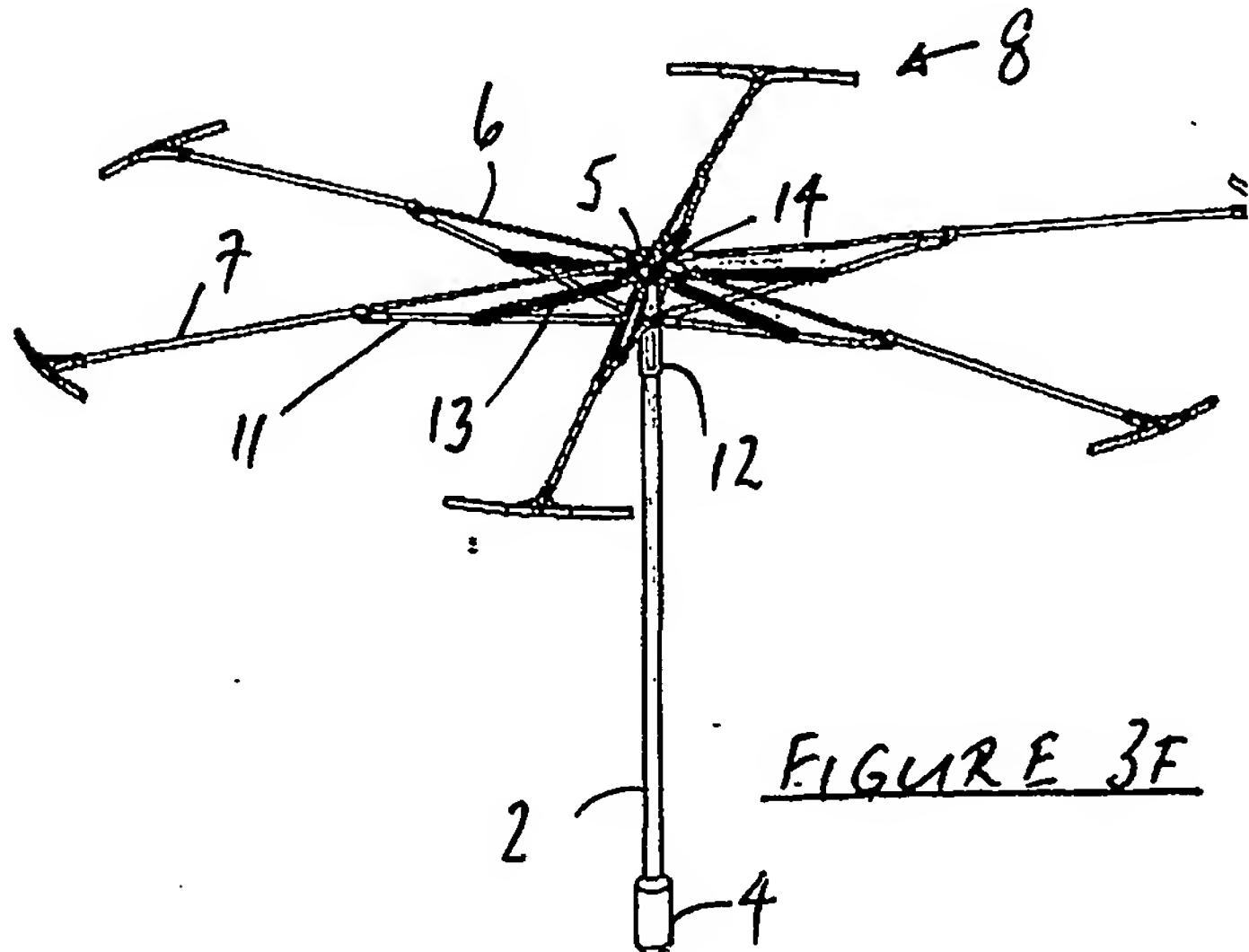


FIGURE 3F

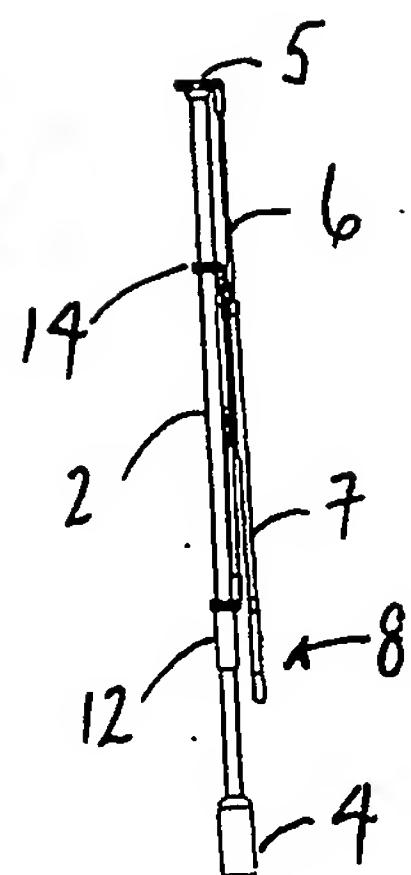


FIGURE 4A

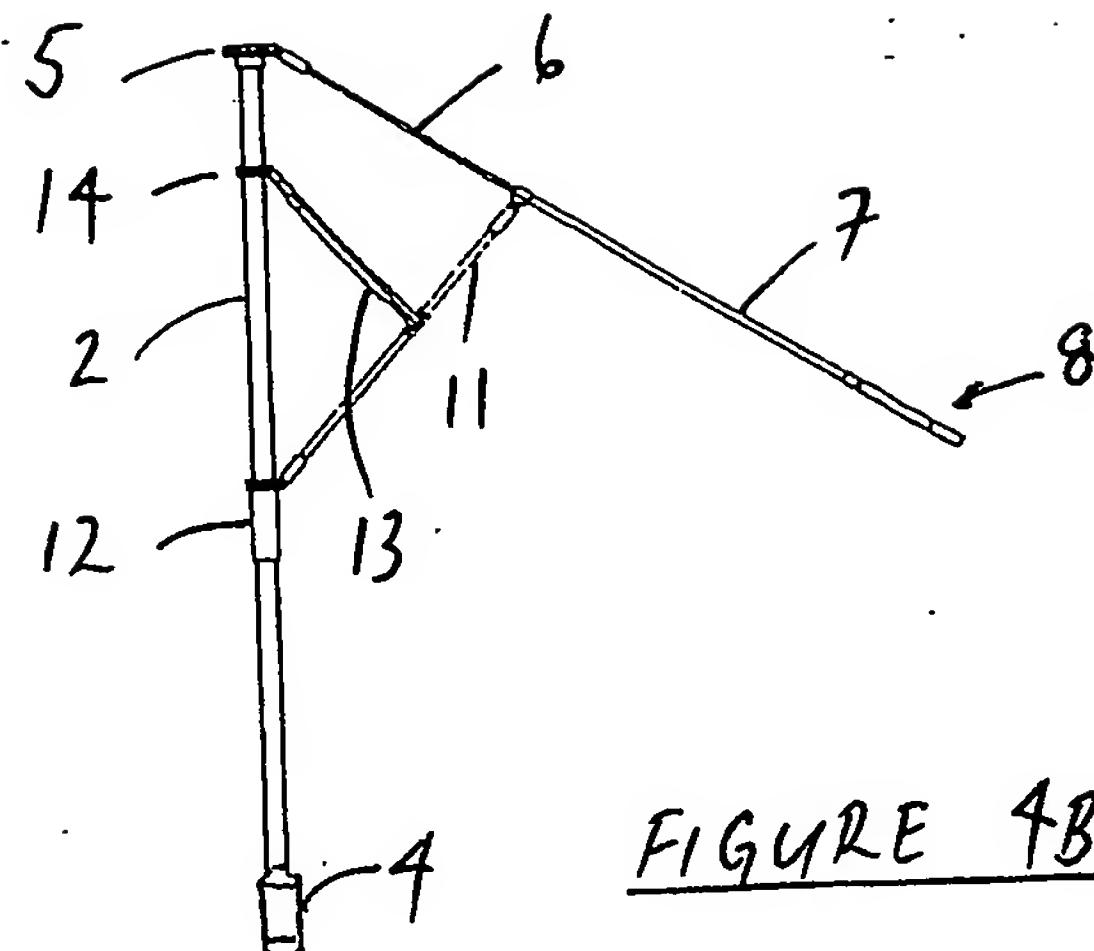


FIGURE 4B

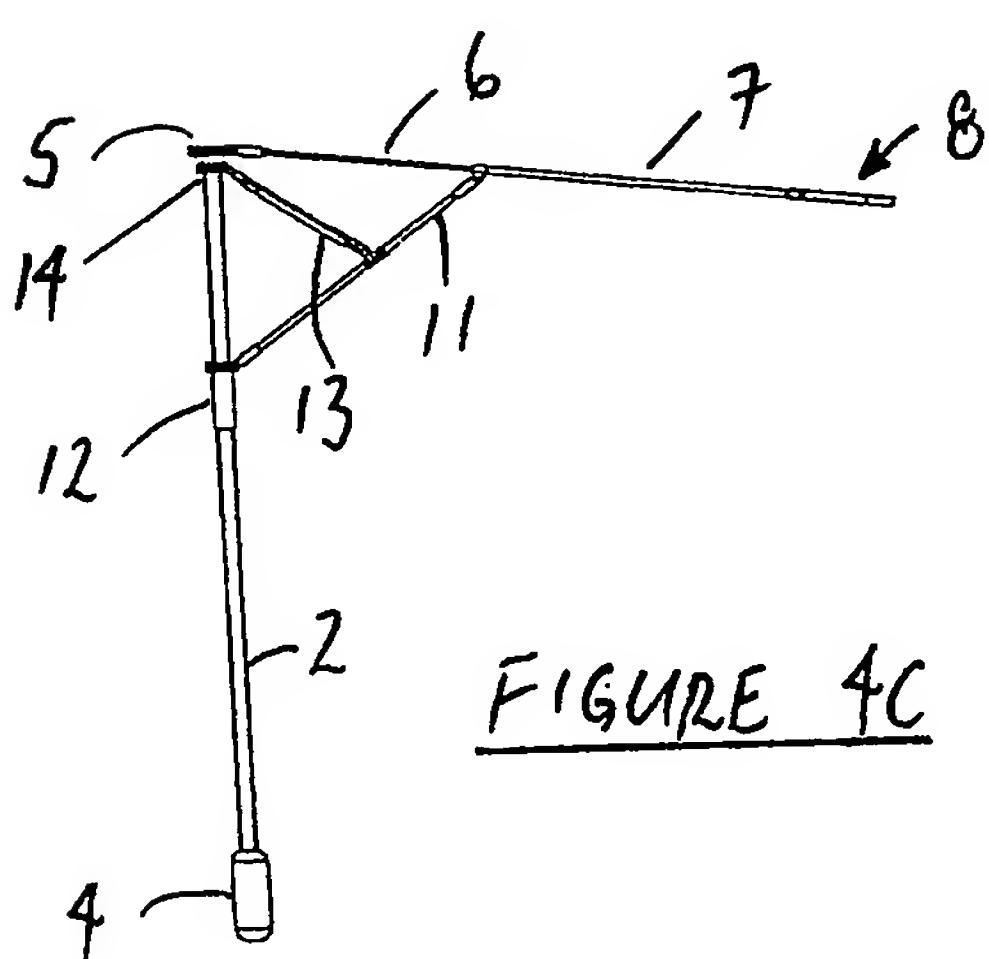


FIGURE 4C

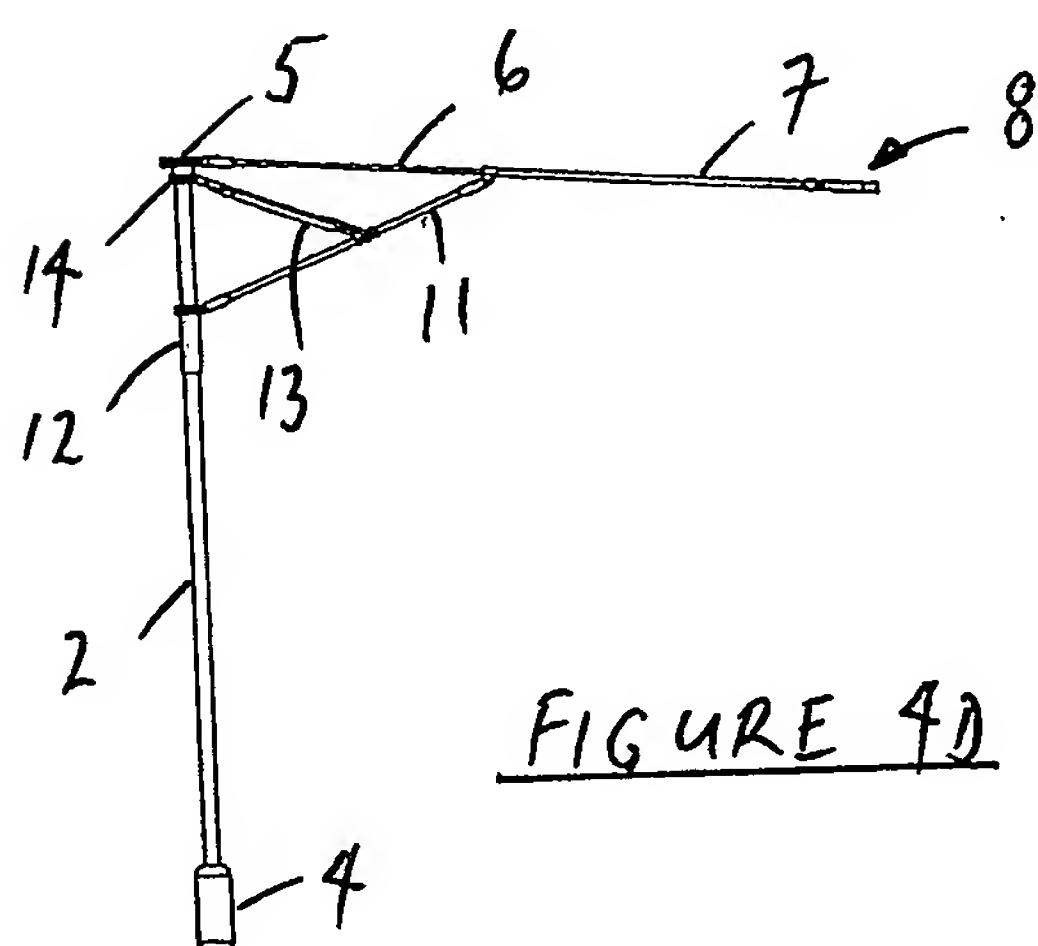


FIGURE 4D

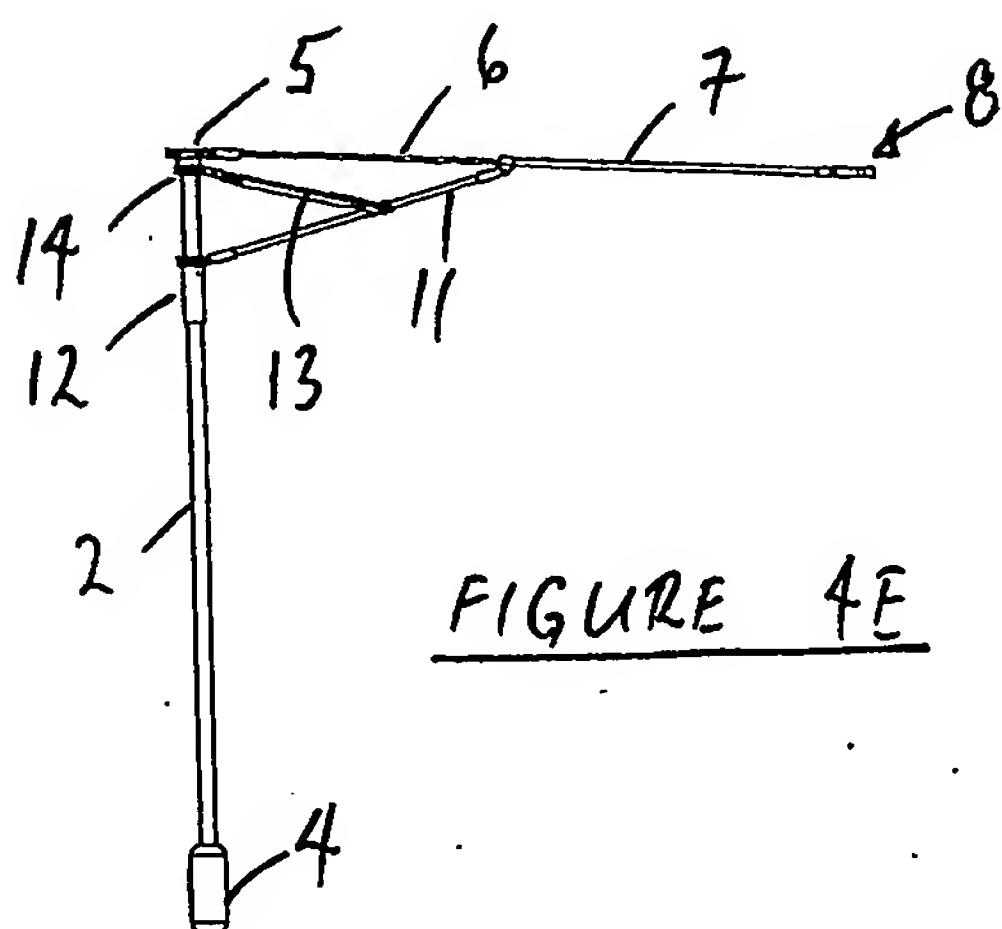


FIGURE 4E

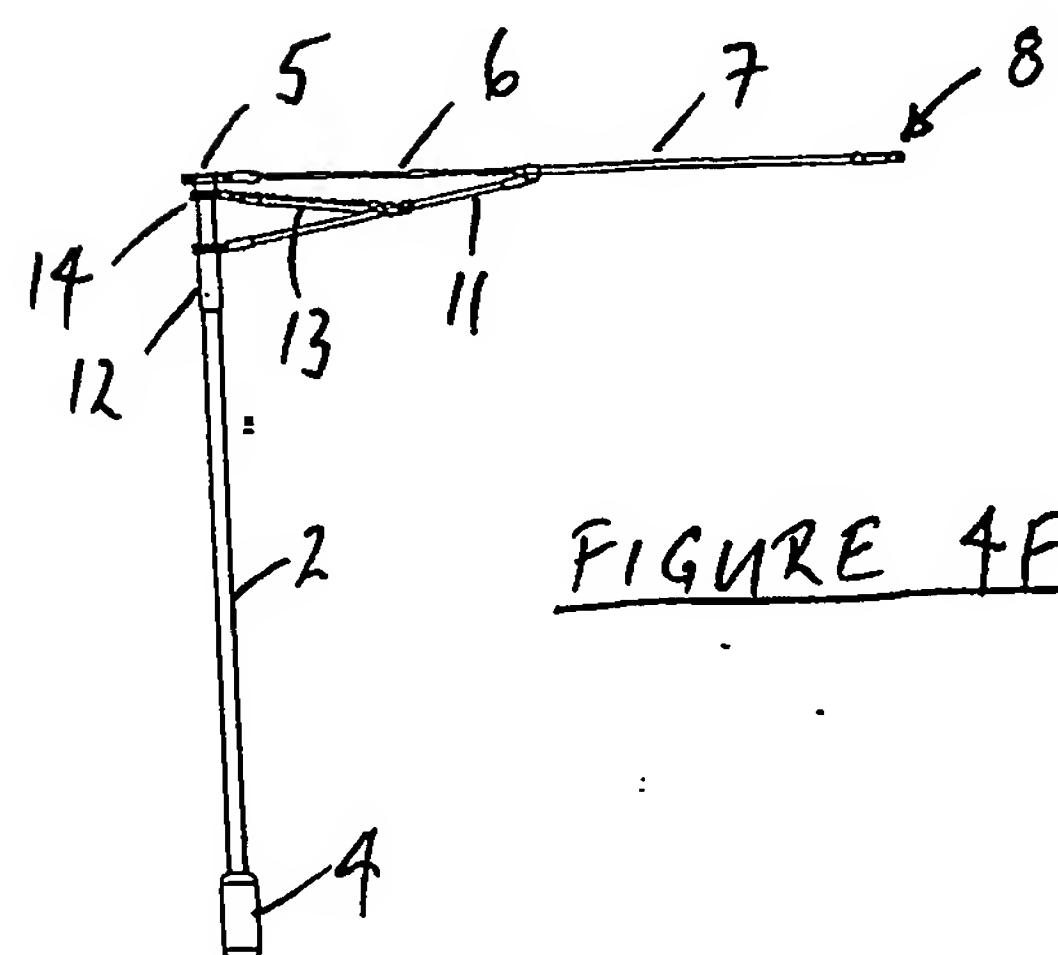


FIGURE 4F

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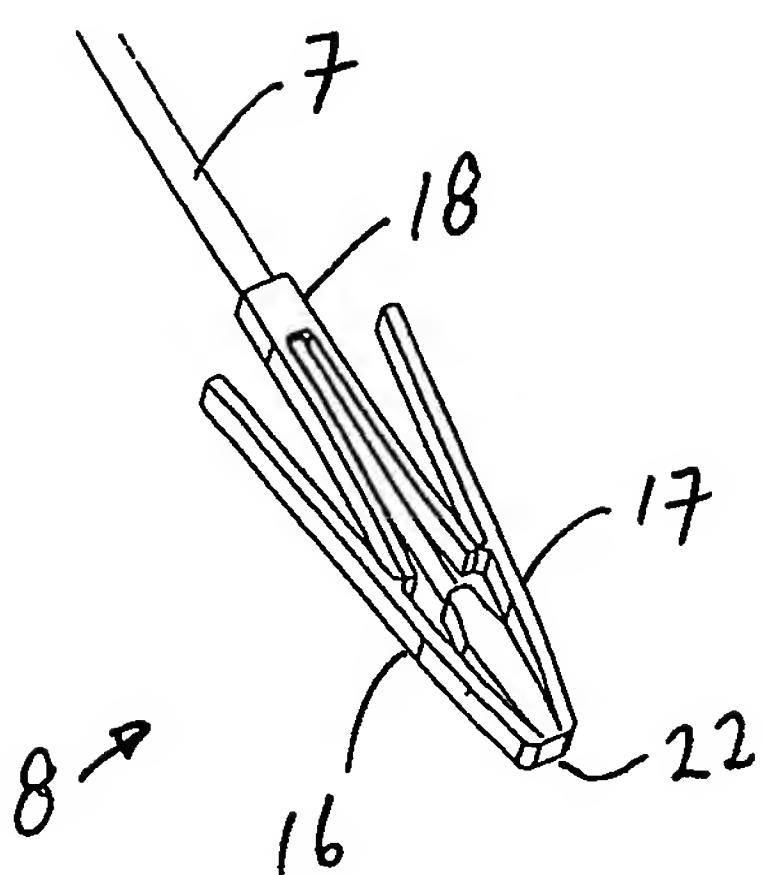


FIGURE 5A

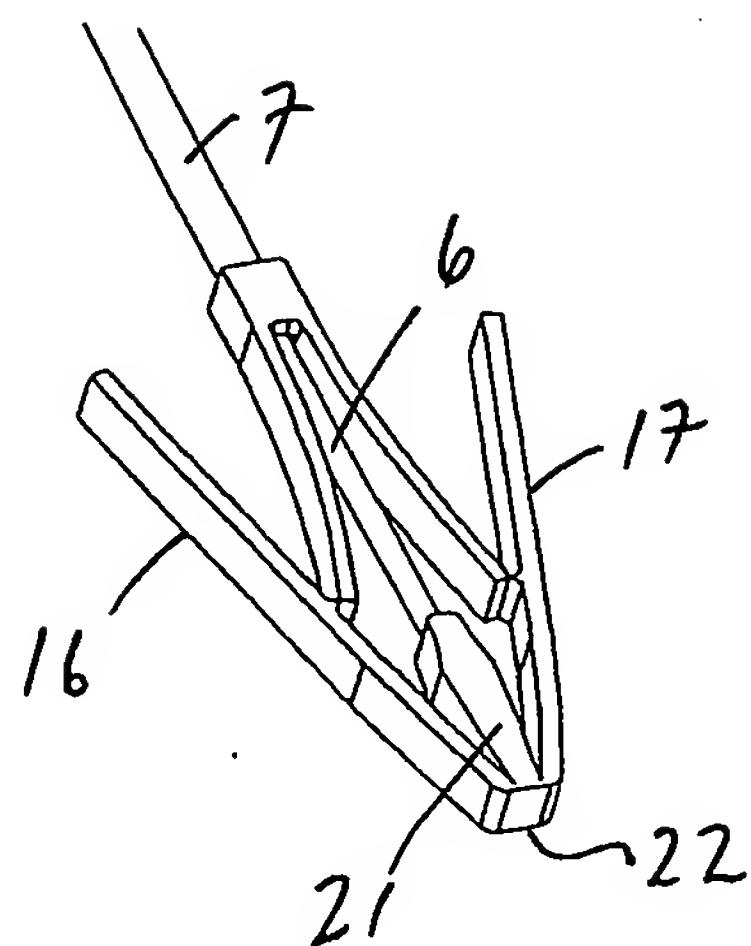


FIGURE 5B

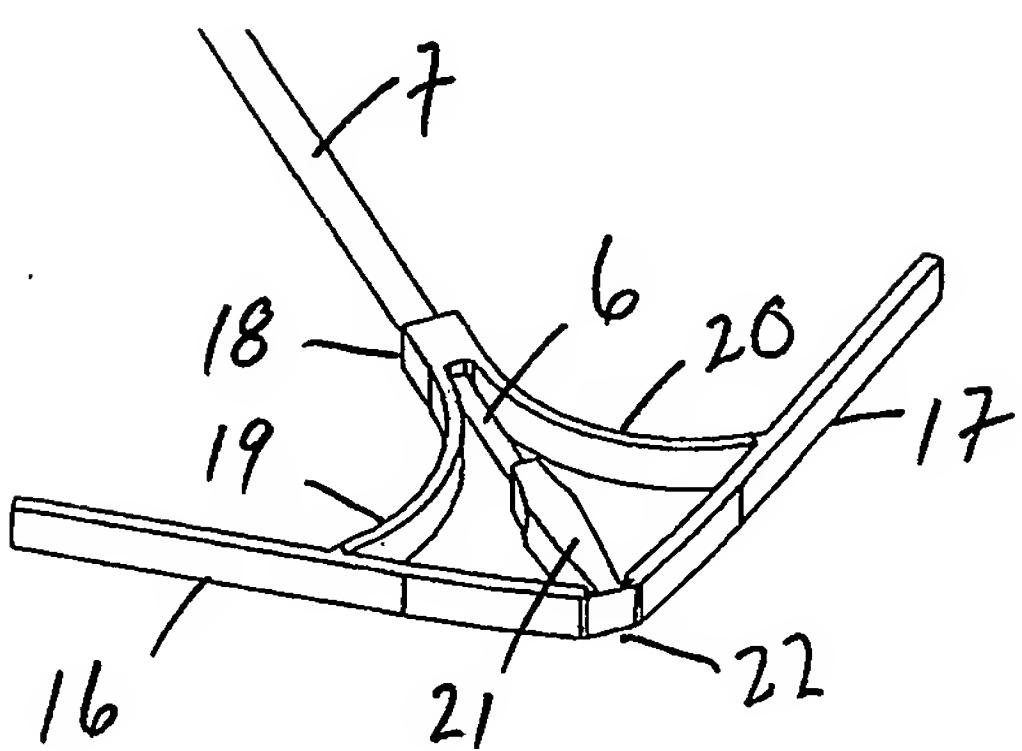


FIGURE 5C

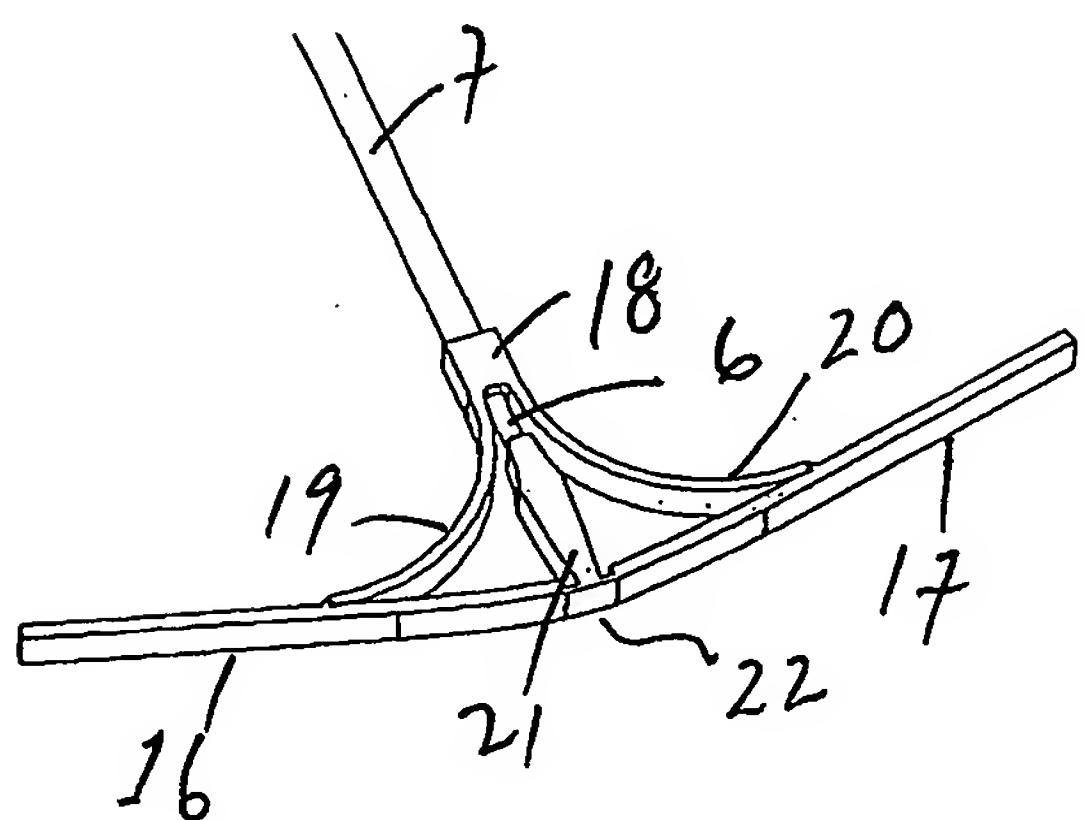


FIGURE 5D

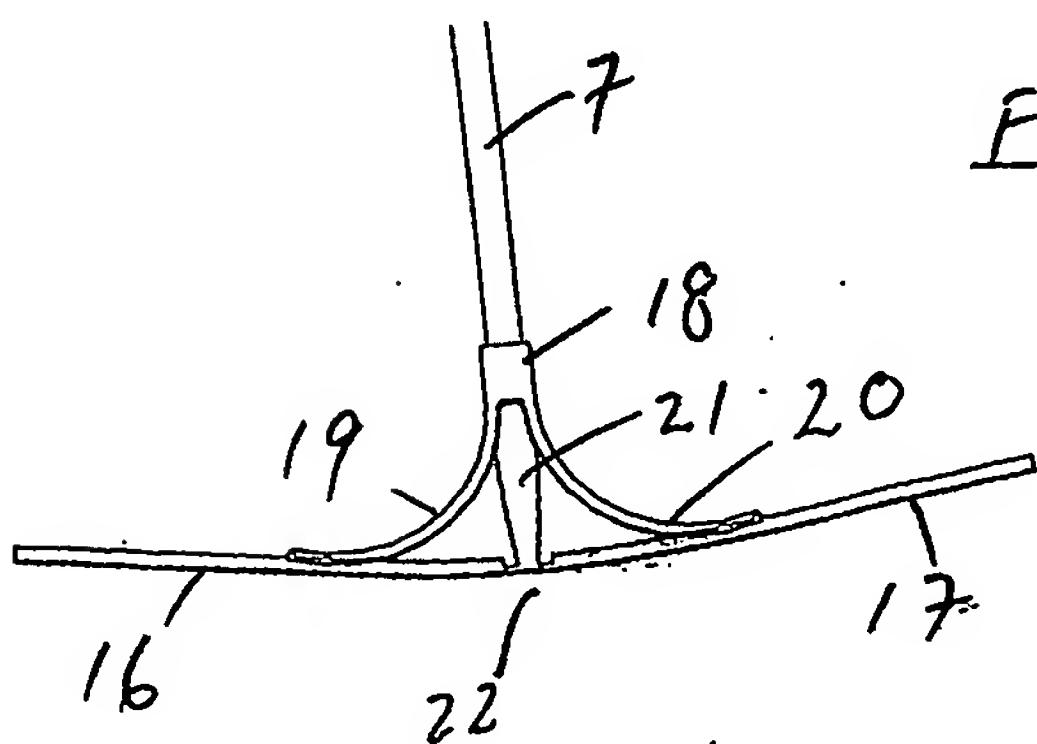


FIGURE 5E

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